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Only through its omnipresence will the BBRI be able to accompany the contractors effectively.
Over the past 20 years and more, the construction sector has undergone major changes that seek not only to reduce the environmental impact of its activities, but also to improve the accessibility, safety and comfort of our buildings. Long past are the days when we merely strove to ensure that a residence was stable and watertight! These changes induced by increasingly strict performance requirements are also profoundly changing the work of construction companies. Such a transformation naturally does not take place without a few hitches, especially since the sector is confronted with growing competition and owners have to possess even larger plots of land in order to be able to create the buildings that correspond to the desired performances.

These realities are clearly reflected in the working plans of the Technical Committees, which form the basis for the Institute’s activities. No fewer than 30 research projects are directly related to the thematic of energy and the environment, 24 concern personal comfort and safety, while 42 are linked to the development of new building systems. Eight projects have the goal of improving and optimising technical installations. Some people thought that passive structures or buildings with nearly zero energy consumption would mean the end for technical installations. We now see that quite the opposite is true: our buildings have never before been equipped with so many high-performance installations. And this tendency does not seem to come to an end soon now that ‘smart’ houses are becoming more and more popular.

The support provided to companies is also becoming increasingly preventive. We do not wish to simply assist contractors in finding a solution for the problems that they encounter on the building site: the BBRI wants to anticipate to the obstacles by identifying them as early as possible and by proposing recommendations that will make it possible to avoid them altogether. This was also the approach of the 2014 thematic issue of CSTC-Contact which highlighted a certain number of recent phenomena that are the result of changes in the design and the execution of our buildings. Awareness-raising and company management training still remain highly topical. A sound and profitable company indeed requires an effective organisation.

In short, the BBRI wants to continue to commit itself to improve the quality of the works, with the objective of enhancing the technical and organisational know-how of professionals, but also of reinforcing the confidence of owners in the sector.

As for the cost component, this is a common element in all of our actions these days. It goes without saying that the BBRI must propose solutions and innovations that are reliable, but it is equally as important that they are financially feasible.

The developments in the construction industry are succeeding each other rapidly. It is the duty of the BBRI to remain active on all of these fronts. This is the only way for the Centre to assist the construction companies in an efficient manner.

**The BBRI present on all fronts**

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Jan Vensternans, ir.  
Director General

Jacques Gheysens, ir.  
Chairman
With its 245 employees, the BBRI is one of the largest collective research centres in Belgium. Its organisation, based on a bottom-up approach that is unique in Europe, rests on the annual work plans of its Technical Committees. These Technical Committees are at the base of all the BBRI’s projects.

The BBRI has eleven Technical Committees (TC’s), each dedicated to a particular trade. Each TC is chaired by a contractor and orchestrated by several engineers appointed by the BBRI and includes a core of representatives from the trade concerned, supplemented by experts (manufacturers, consultancy offices, etc.). These Committees ensure that the Institute focuses on the practical problems encountered by building professionals. They orient the research towards areas of interest to the sector and define their needs in terms of publications. Furthermore, three Committees exist which are potentially relevant for all trades and which focus on hygrothermy, acoustics as well as consultation with the project designers.

Just as in 2013, the structure of this new Annual Report is based on the ‘Cap sur 2015’ publication. It is therefore organised thematically in order to bridge the gap between the different building trades. The objective of this approach is to ensure that the work of each individual trade is known, understood and taken into account by the other trades. To achieve the desired performance level, it is crucial that all actors work together in symbiosis.

1. Energy construction

   Establishing recommendations for constructing (nearly) ‘zero-energy’ buildings.

2. Technical details

   Putting at the sector’s disposal technical details that are optimised with regard to all requirements.

3. Energy renovation

   Proposing a pragmatic approach for the energy renovation of existing buildings.
The actions of the Institute described in the following pages therefore follow a thematic classification:

- Energy and Environment
- Comfort, Health, Accessibility and Safety
- Building Materials and Systems
- Technical Installations.

Each cluster is structured along six main themes that largely trace out the course that the BBRI will follow in the coming years. These themes, presented below, are illustrated by an icon that constitutes a benchmark for each of them.

For each project that is briefly described in this document, more detailed information can be found in the ‘project’ fiches which can be consulted at www.bbri.be. A list of the ongoing projects is annexed to this Report, including the details of the subsidising bodies.

The BBRI continues to expand the information supplied to professionals, and to contractors in particular. In 2013, it completely revised its website, in order to make it easier to access this information. However, we notice that many companies are not adequately using the many tools that are placed at their disposal. However, once they have been made aware, they quickly adopt the proper reflexes.

The message could not be clearer: raise the awareness of small and medium-sized enterprises and very small businesses that do not yet know bbri.be. For this reason, the Institute invited the contractors from the provinces of Limburg and Liège to a movie premiere. This event was the ideal opportunity for the Institute to present the rich content of its site, but also to meet its members in a laidback atmosphere. No fewer than 600 people participated in these evenings.

Encouraged by this overwhelming success, the BBRI will continue on the same path in 2015, with the ambition of reaching even more construction companies by visiting the country’s other provinces. No doubt that – with the help of the world’s most famous secret agent, whose latest cinematographic adventures will be given a place of honour – the mission will not prove to be impossible.

The BBRI sets up a national action plan

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Informing and training the entire sector by taking maximum advantage of today’s communication tools.

Participating in the creation of a quality framework which increases the confidence placed in the sector.

Playing the role of catalyst in order to stimulate and accompany any innovation process in the construction world.
Regulations on thermal efficiency are continuously getting stricter, and this trend is sure to continue in the coming years. Modern buildings are thus being subject to new expectations such as airtightness, for example. These new performances must be integrated but at the same time the construction costs must be kept under control.

The necessary energy

To create buildings with nearly zero-energy consumption the energy needs must be reduced drastically. Thermal insulation plays a preponderant role in this context. Together with the airtightness of buildings and effective ventilation systems (see the ‘Technical Installations’ section, p. 22), it constitutes one of the pillars of the BBRI’s activities in this field.

Several actions were conducted with regard to the thermal insulation of walls in both new constructions and renovations. Amongst others, the Gevisol-ETICS research project, which studies systems of renderings on external insulation, and the RENOFASE project, which focuses on insulation techniques via the interior that are primarily applicable in renovations.

The joinery elements also constitute an essential part of the building’s envelope. These elements must constantly evolve in order to comply with the new requirements, and the DuraPerf and ISOLA 2020 projects were conducted in this perspective. In addition to guaranteeing the performances generally expected from a joinery (airtightness, watertightness, mechanical strength, etc.), these studies were designed to improve the durability of these performances and to optimise the energetic performances of the joinery.

Besides their energy performance, our buildings also have to offer a comfortable indoor ambiance. To be able to guarantee the visual comfort of the occupants and prevent overheating during the summertime, shading devices are required. The range of available products is enormous, and there is no shortage of selection criteria. The PROSOLIS project focused on evaluating the energy and visual behaviour of such shading devices in order to permit the actors of the construction sector to choose this type of product with full knowledge of all the relevant facts.

Once again this year, the thematic of the airtightness of buildings was at the centre of the BBRI’s activities, with several studies being conducted in this area. The project Luchtdicht bouwen van A tot Z project made it possible to personally assist more than twenty contractors and architects as they integrated airtight construction into their building process. Expanding their knowledge on the subject will make it possible for them to propose optimised technical details, by highlighting high-performance solutions that can be achieved at lower cost. Interesting results were obtained, for example the on-site characterisation of air leaks associated...
energy and Environment

Completed in 2014, the DREAM project reviewed the airtightness performance and the durability of materials and junctions.

The competition Bâtiments exemplaires Wallonie (Exemplary Buildings Wallonia, www.batiments-exemplaires-wallonie.be) also continued. An exemplary building is one that is notable in the way it meets a series of sustainable construction criteria, which are thus no longer limited solely to the energy issue.

The requirements of regional regulations on the energy performance of buildings (EPB) have been strikingly reinforced in recent years; and this trend seems to continue. Indeed, by 2021, Europe will be imposing nearly zero-energy consumption levels for new buildings. That is why the BBRI is supporting regional authorities in establishing a common calculation procedure. Moreover, an EPB Consortium bringing together more than a dozen teams was founded and is conducting, at the request of the three Regions, studies aimed at ensuring that the EPB regulations evolve in a coherent manner. In addition, the BBRI is participating in the concerted European action EPBD CA3 revising the European directive on the energy performance of buildings which is at the origin of these EBP regulations. Also on the European level, the QualiChEck research project was launched in order to highlight methods which can improve the quality works and which should result in correctly declared performances in terms of the regulations. Themes like airtightness and the ventilation of buildings are specifically being studied in this context.

The construction sector daily faces the challenge of integrating the different performances expected of buildings with regard to the technical details. Several actions aimed at developing, validating, optimising and disseminating integrated technical details were carried out in 2014. The STAR research continued. This project is designed to provide the construction sector with technical details that are applicable to renovation and optimised in terms of energy and acoustics.

Integration of outdoor joineries to the rough structure constitutes one of the technical details on which many actions are focused. The work continued on the revision of the Technical Information Note 188 ‘La pose de menuiseries extérieures’ as well as of the prenormative research Evaluatie van de prestaties en duurzaamheid van hoogperformante vensters en hun aansluiting op de ruwbouw.

Some details, such as the insulation of roof window frames, formed the object of particular research which confirmed the necessity of insulating the periphery of these kinds of windows.

Even more than the construction of new high-performance buildings, the energy renovation of existing buildings will constitute the challenge for the coming years. A number of studies are being conducted in this context. The "RENOFASE" project intends to remove all barriers – whether technical or not – which prevent the renovation of existing buildings. In this context, by means of full-scale testing, research is performed with regard to insulation techniques via the interior of existing walls as well as to the evolution of the hygrothermal behaviour of brick walls insulated via the interior. This project is also focused on drafting technical details specific to the technology of insulation via the interior.
Through the Woning-Renovatie test bench, the BBRI is coordinating a broad range of demonstration projects devoted to the renovation of dwellings in the Flemish Region. For this purpose, renovation projects that are reproducible and applicable on a large scale are being followed up. The affordability of the solutions developed during these projects is central to this action.

In the Walloon Region, the BBRI supervised the introduction of the procédure d'avis énergétique (energy auditing procedure) PAE 2 project which is applicable on a voluntary basis to existing housing. The Institute has also supported the application of the energy certification for existing housing and assisted the three Regions in the development of the energy certification procedure for non-residential buildings.

In 2014, the theme of energy was the subject of numerous actions to provide information to the sector: presentations and seminars, but also various BBRI publications and videos.

The 2014 winter courses focused on the energy renovation of buildings. More than 500 persons participated in these courses which were organised in nine provinces during two evening sessions, dedicated to both the renovation of the building’s envelope as well as to the technical installations.

Multiple information sessions and seminars were also organised both in Wallonia and in the Brussels-Capital Region. These were composed of two cycles, addressing fourteen themes relating to the rational use of energy in buildings and to existing renovation possibilities. Many information sessions were also held in the Flemish Region, most often at the initiative of the professional organisations.

Seminars were organised together with the professional federations concerned in the three Regions of the country. For example, the ‘Démolir ou rénover’ seminar which attracted nearly 400 participants during its three editions.

The Standards Antenna Energie et climat intérieur (Energy and Indoor Climate) was drafted to inform the sector on normative evolutions in this area, notably via lectures or via the website www.normes.be.

Roof insulation works were a focal point of attention in 2014. Two Technical Information Notes, one dedicated to the thermal insulation of sloped roofs (TIN 251) and the other to the construction of roof car parks (TIN 253), were published during the year.

Supplemented by a 10-minute video illustrating the principles set forth in this document, the Technical Information Note 251 was downloaded more than 2,300 times over the last four months of 2014.

Created in 2010, the working group drafting the TIN on the airtightness of buildings completed its activities. This document, eagerly expected by the entire sector, should be published in 2015. Several seminars, information sessions and lectures on this subject were organised during the year. This dissemination of information is also supported by the actions of the thematic information platforms ‘Tightvent’ (www.tightvent.eu) and ‘AIVC’ (www.aivc.org) in collaboration with the BBRI.
Various actions were conducted in 2014 in order to improve the quality in the construction sector, notably by means of establishing a quality framework.

The quality framework for the post-insulation of hollow walls has been applicable since 1 July 2012. In 2014, Flanders, where the grid managers only grant subsidies to works that are compliant with STS 71-1, recorded an increase in filling up of the cavity with 15% compared to 2013. A survey that was carried out by the Flemish Energy Agency (VEA) reveals that more than 95% of the owners who participated, stated that they were satisfied with the works performed as well as with the contractors in charge. Moreover, 50% of them stated that they would not have performed the works if there had not been a quality framework in place.

The BBRI drafted the STS-P 71-3 dealing with the execution of pressurisation tests. Published by the FPS Economy in December 2014, this document was discussed and approved within a large working group. These Technical Specifications supplement the existing reference documents (standards and regulations) and specify the rules to be followed when conducting pressurisation tests. Furthermore, they provide for the possibility of framing the tests with a quality system that notably verifies the competence of the measurers and the reliability of the performances declared as a result of the tests.

In 2014, the Institute also focused on drafting Technical Specifications on the performances of ventilation systems (ventilation flows, acoustics, etc.). Ultimately, when it comes to verifying the performances of ventilation systems, the EPB regulations may refer to the directives of these STS’s, which will thus have a major influence on practice.

Finally, work continued on the STS 71-2, which sets requirements for the external insulation of facades. The corresponding quality framework still needs to be further elaborated.

The actions of the Technological Advisory Services constitute an important vehicle for stimulating innovation in companies of the sector. In the Brussels-Capital Region, the Advisory Service Eco-construction et développement durable (Eco-construction and sustainable development) assists the sector with regard to energy and the environment. An information cycle specifically devoted to energy renovation was organised in this context. In the Walloon Region, the Technological Advisory Service COM-MAT ‘Matériaux et techniques de construction durables’ supports actors of the construction sector in order to encourage innovation relating to technologies that improve the energy performance of buildings.

The introduction of the evaluation system 1D Innovation made it possible to technically evaluate sustainable and innovative materials, techniques or construction concepts often having a favourable impact on the energy performance or the indoor climate of buildings.

Innovative projects were also conducted like the PERFECT research, which is devoted to on-site evaluation of the real energy performance of building envelopes, was completed in 2014. This thematic was also continued in an international research action within the framework of the International Energy Agency (IEA EBC Annex 58). Within this same thematic, the MEASURE research was initiated in order to verify the real performances as well as the satisfaction of the occupants of high energy performance buildings.

The BBRI – Annual Report 2014
The impact of energy consumption is thus lower than that of materials used.

The influence of the use of materials on the environment is considered throughout their lifetime (extraction of raw materials, production and transport to the worksite, processing at the worksite, necessary maintenance, replacement and, finally, demolition and landfilling or recycling of the rubble).

In this context, the BBRI actively participated in the works of the international standardisation committees on both the international (ISO TC 59 SC 17) and the European (CEN TC 350 ‘Sustainability of construction works’) level. Within this framework, the Institute is the sectoral operator for the Belgian construction sector and it is closely monitoring the legislative initiatives striving to create a federal EPD database (Environmental Product Declarations) as well as those bearing on the Royal Decree of 22 May 2014 setting minimum requirements for environmental messages on construction products.

At the request of the industry, the BBRI also conducts studies in order to analyse, according to the methods established in the European standards, the impact of the construction material on the environment. For example, the BBRI is participating in the drafting of the EPD’s that will serve, in the short term, as the basis for calculating the environmental impact of a building or even entire districts.

The project LC Build fits within the context of the strategic platform Brussels Retrofit XL and studies the environmental and social aspects of the renovation of housing units by taking from a life cycle point of view. Within the framework of this project, the BBRI is analysing the environmental impact of an innovative light floor, the use of prefabricated renovation solutions and new external insulation applications.

At the request of the industry and contractors, the BBRI conducts applied research on new methods and materials that make it possible to reduce the environmental impact of our built framework. The European project LEEMA focuses on innovative insulating materials and on concepts of insulating masonry with a low environmental impact.

The Walloon Greenwin project LOWEMI also pays a lot of attention to the environment and health. It seeks to develop interior coverings that emit very few harmful substances during both the installation and the use phases.

As stated in the Communication COM (2011) 571 ‘Roadmap to a Resource Efficient Europe’, materials and raw materials are high on the European political agenda. This document focuses on the possibility of maximally recycling waste material in order to produce new materials, and invokes concepts such as the material recycle cycle and circular economy.

Within this framework, the construction sector certainly has a role to play by further encouraging sustainable materials, waste recycling and high-quality projects. In the long run, these steps will contribute to a competitive construction sector and the development of a resource efficient building stock.

Using recycled materials is one of the solutions to reduce the environmental impact of construction in general, and more specifically the impact of the construction materials. The BBRI is already familiar with the problematic of recycling and the use of raw resources. The NIB project FUTURE CONCRETE ‘Stortklaar beton voor de toekomst’ notably strives to promote the practical use of ecological concrete (based on recycled granulates). The Walloon project RECYDESA strives to increase the valorisation rate of recycled light materials, with a special focus on techniques for cleaning construction and demolition wastes. In 2014, the Institute also participated to the European Interreg project CEAMaS (www.ceamas.eu). French, Irish, Dutch and Belgian partners are collaborating to compile a list of the application of marine sediments in the construction.

The renovation of existing buildings constitutes a major challenge, all the more if one envisages an efficient use of raw materials. The collective research project RenOZym strives to find new techniques for cleaning facades, roofs and terraces without losing sight of important aspects such as the health impact during the execution of the works and the possible evaporation of certain chemical products and biocides. This Walloon project focuses on the development of ecological technologies that are based on new formulations with micro-organisms and enzymes.
The BBRI played a significant role in the creation of the *Cahier des charges type Bâtiments 2022* (Walloon Buildings 2022 Standard Specifications), whose explicit objective is the implementation of sustainable buildings or renovation projects thanks to a single standard set of specifications. Within this framework, the Institute collaborated with the private and public sectors and focused primarily on the classification structure (based on the nomenclature of the specifications of the housing company SWL), the normative changes and the updating of the technical content. The standard ‘*Cahier des charges type Bâtiments 2022*’ pays particular attention to the themes of energy, waste management, accessibility and fire safety, so that sustainable construction can be recommended in all cases. Thanks to these specifications, contractors now have a good overview of the latest technologies.

The BBRI takes its role seriously as a catalyst for stimulating and monitoring all innovation processes in the construction world. The ‘ID Innovation’ project (www.idinnovation.be) was launched with the support of the Walloon Region. With this project the Institute elaborated a procedure for the simplified technical evaluation of sustainable and innovative products in the construction sector. In 2014, this procedure was completely developed and has already been applied to a certain number of products and systems.

The objective of the ‘ID Innovation’ project is to issue, within a period of 3 to 8 months, a declaration of the fitness for use based on an independent evaluation of the product. This declaration was developed to increase the confidence of owners, architects and contractors and to rapidly respond to the needs of the industry when putting innovative products or systems on the market.

The Technological Advisory Service ‘*Eco-construction et développement durable*’ in the Brussels-Capital Region and ‘COM-MAT’ in Wallonia provide innovation support for sustainable materials and techniques. The specific objective of the Technological Advisory Service VALOWALL moreover is to accompany Walloon companies in their innovation projects with regard to waste management and recycling, by concentrating on the industrial by-products as well as contaminated soils and sites.

Within the framework of a synergy between the industry and the research centres, the project of the ‘Environmental and Energy Technologies Innovation Platform’ (*Milieu- en energietechnologie Innovatieplatform* or MIP) GREENASH developed a treatment process in order to valorise clinkers qualitatively in both material and energy terms.

Environmental impact, one of the three pillars of sustainable construction, focuses on societal, economic and ecological aspects. In 2014, the BBRI continued to follow the developments of sustainable construction in order to ensure, on the basis of its technological knowledge, a greater coherence between the ongoing initiatives for evaluating the sustainability of construction elements and buildings. Within this framework, particular attention is paid to the technical and scientific principles of sustainable construction that may be applied (and supported) on the worksites of today and those of tomorrow.

**Concrete based on recycled granulates (ecological concrete).**
Comfort, Health, Accessibility and Safety

The rise of ecological concerns and of low energy consumption construction has led to a rapid technological evolution which resulted in new constructive methods and details. Comfort, health, safety and accessibility are important concerns when designing ecological buildings with low energy consumption. These aspects must be taken into account during both the construction process as well as during the use phase.

Outdoor noises coming from technical installations or the surrounding neighbourhood can start out as a mere comfort issue, but when they lead to stress and sleeping disorders, they can also affect the health of the occupants of the building. It is thus no luxury to protect them from these noises. Zero-energy buildings need to demonstrate a good airtightness, but inadequate air renewal entails risks for the occupants. The water quality also has an important influence on health issues: tap water must be free of pollutants or pathogens. Furthermore, it is also essential that contemporary buildings are accessible and safe for all sorts of users.

The main objective of the VIS project Instal 2020 launched in 2014 is, in short, to offer the necessary comfort to the end users of buildings with nearly zero-energy consumption, whether new or renovated. Besides energy and comfort (faucet waiting times, etc.), a lot of attention is paid in this research to water quality.

Given the complexity of the available technologies and the large number of companies concerned (often small enterprises), it is advisable not to neglect the design and the execution of technical installations. That is why the ‘acquisition of knowledge’ part of the Instal 2020 project focuses on the energy performances of heating installations and installations for the production and distribution of sanitary hot water; particular attention is paid to the:

- the integration of sustainable generators
- the possibility to choose for separate or combined production systems
- the comparison of collective solutions (combi loops) with individual heating systems
- the influence of the design and the dimensioning.

In addition to a code of good practice, several computerised tools were also developed for the sector, namely:

- an installation indicator that indicates the optimal combination between the production system and the distribution system according to the project’s characteristics (size of the building, envelope, number of users, etc.) and the desired comfort level. Not only the water and energy consumption but also the costs are taken into account
- various dimensioning software programs making it possible, on the basis of an isometric scheme, not only to dimension the pipes in the installation, but also to select and to dimension the emission system. These tools can also indicate the optimal ‘capacity/ storage volume ratio’ for the production of heat central heating and the production of sanitary hot water
- a separate tool to calculate heat loss.

Guaranteeing a healthy indoor environment within a context of nearly zero-energy consumption is also the objective of the prenormative research project PRE-VENT “Ventilation des logements : critères de performance et règles de conception des systèmes” (Ventilation of dwellings: performance criteria)
and design rules for systems). Launched in 2014, this project is the result from a close collaboration between the BBRI and the University of Ghent. Just like heating systems and systems for the production of sanitary hot water, the dimensioning, design and processing of a ventilation system are crucial for a proper and energy-efficient functioning, as well as to ensure a good indoor air quality.

The regulatory context, however, has thoroughly changed in recent years, primarily under the impulse of the EPB regulation, so the time has come to update the ventilation standards (for example, the NBN D 50-001, which dates from 1991). The BBRI wants to contribute to this effort by means of the ‘PRE-VENT’ project, which strives to correct a number of shortcomings in the current standards, by establishing adequate design and/or dimensioning rules of design and/or dimensioning in order to:

• guarantee an equivalent air quality between the different ventilation systems, whether natural or mechanical
• reconcile air quality and energy savings with the regulation and ventilation systems on demand
• to improve the air quality and/or to reduce the energy consumption of hybrid systems.

To respond to these needs, this project focuses on two research areas: the performance criteria making it possible to define air quality, and the design and dimensioning rules that can guarantee energy-efficient ventilation systems.

Initially, the air quality will be translated into required flow rates and recommended regulation strategies, mainly by using digital simulations. Secondly, design rules based on digital simulations and on-site measurements will be developed for systems featuring natural air supply and/or air evacuation and for hybrid systems.

Accessibility to a large group of users is one of the characteristics of high-performance buildings. For some time now the BBRI has been focusing on the technical details that make it possible to improve the accessibility of building entrances. However, it is not always easy to reconcile the requirements in this area with other technical performances (watertightness and airtightness, for example), especially at door thresholds. This problematic was studied in 2014 within the framework of the Technological Advisory Service Eco-construction et développement durable (Eco-construction and sustainable development) in the Brussels-Capital Region, which focused on the technical details of an entry door on the ground floor and of a door that leads to a balcony or a roof-terrace.

Initially, good acoustical insulation primarily seems to improve the comfort, but it also results in many other health benefits. During the day, excessive exposure to noise can be a source of irritation, but, at night, such noises can disrupt the sleep and thus lead to sleep deprivation, illness or even premature death. Many building professionals still consider acoustics as an inaccessible subject. RaDS II ‘Robust Acoustic Details Standard II’, a project financed by the FPS Economy and the NBN, and conducted in collaboration with the KU Leuven and the ULg (CEDIA), made it possible to develop a large number of constructive concepts for apartments and semi-detached houses. Thanks to these concepts it is now relatively easy to build high-quality buildings from an acoustical perspective, without having to possess an in-depth knowledge of the subject.

These construction concepts consist of several constructional nodes with regard to the design and the execution. A number of check-lists are also presented which consist of tables with the performance requirements for the materials used, the distances to be respected and the assembly details. The construction concepts are based on calculation models partially developed by the BBRI within the framework of the RaDS research, on the basis of hundreds of simulations of constructional nodes and validation measurements performed in the laboratory and on site. The calculation models developed by the BBRI have now been integrated into the acoustics Eurocodes of the NBN EN 12354 standards.

Fire safety regulations undoubtedly have major repercussions on the design and processing of several building details and junctions. The basic standards as established in the Royal Decree determine the scope and general requirements, but, depending on the specific nature of the building...
Comfort, Health, Accessibility and Safety

(retirement homes, hospitals, schools, prisons, etc.), they can be supplemented by regulatory and normative texts issued by the Regions, the Communities or the FPS’s. In the Standards Antenna (SA) Prévention au feu (Fire prevention), the BBRI already formulated recommendations regarding this subject. In 2014, attention was also paid to the fire safety of constructive details.

The project DO-IT Houtbouw ‘Innovation durable sur le plan de la technologie et du confort pour des applications du bois dans la construction’ is developing integrated and validated solutions for solid wood and wood-frame structures. The wood-frame systems make it possible to incorporate substantial layers of thermal insulation in facades, without exceeding the thicknesses of traditional walls. The challenge of this project resides primarily in reconciling the (sometimes contradictory) limiting preconditions regarding structural behaviour, fire safety, acoustics, wall and floor thickness, prefabrication and the ultimate construction cost.

Finally, the research led to quite spectacular results in 2014, more specifically through the development of innovative construction methods for wood-frame structures. These systems, which integrate possibilities of prefabrication, offer a better fire resistance and have acoustical performances that are similar to those of optimised traditional solid structures (identical floor and wall thicknesses, but with significantly lower masses). Their structural behaviour and fire safety were optimised and documented with the aid of numerous details and constructional nodes. These new building methods were presented to the sector in lectures and workshops.

In 2014, the STAR ‘Sustainable Thermal Acoustic Retrofit’ project reached its final phase. Conducted in collaboration with the ‘Passive House’ Platform, the Building Research Establishment (Scotland) and Lund University (Sweden), this project made it possible to develop a large number of technical details for the acoustical and thermal renovation of a building. However, the execution of these details is made more difficult by the multidisciplinary character of energy renovations. Indeed, energy renovations often lead to new problems: inadequate fire safety, insufficient acoustical insulation, etc. Even when the job is difficult, these deficiencies must be overcome, otherwise the building’s comfort and use will not be optimal. This project notably resulted in a large number of ‘4D’ details (constructional nodes and construction elements developed in ‘3D’ that are complemented by information sheets describing the order in which the works must be performed).

In 2014, the test bench Woning-Renovatie was launched on the theme of innovation in energy-efficient renovation. The BBRI, as coordinator of the Platform of competences for the renovation of housing in Flanders, is extensively involved in this initiative. This Platform oversees ten test bench projects, each dedicated to a specific theme bringing together a consortium composed of companies, owners, consultancy offices and expertise centres. The objective of this platform is to support the individual test benches, with the following tasks and responsibilities:

- to constitute a unique information point in order to be able to respond to the needs of companies belonging to the target group, but also to guarantee visibility in Belgium and abroad
- to acquire knowledge and provide the necessary support to the various projects with regard to methodology, technology and processes
- to guarantee quality by proposing guidelines for energetic measurement campaigns of for the optimisation of costs
- to disseminate the knowledge to the target groups.

The BBRI itself is actively involved in two test bench projects. The Ecoren project ‘Energetische renovatie van Vlaamse representatieve eengezinswoningen en appartementsgebouwen’ envisages the sustainable renovation of two housing blocks with four dwellings and an apartment building containing nine housing units, by applying BEN (bijna-energie neutraal – nearly-zero energy consumption) renovation concepts capable of being reproduced on a larger scale. While the interaction with the end user, both on the private market and within the framework of social housing, is a central element of the project, special attention is also paid to health and comfort.
Comfort, Health, Accessibility and Safety

The Mutatie+ project ‘Mutatiewoningen harmonieus geüpgraded met modulaire technieken in functie van levensloop, leefcomfort en energiebesparing’ is the second test bench project to which the BBRI is closely collaborating. Being one of the few projects to be coordinated by a construction company, it is essentially striving for a concept of integrated renovation composed of a modular structure, an internal and external insulation and pre-assembled elements (bathroom and/or kitchen). This type of renovation is performed during the transition period between the old and the new occupants, while the building is uninhabited. The goal of the project is to raise the awareness of occupants and to convince them to renovate, offering feasible and affordable renovations which aim to improve the comfort and create a living environment that is adaptable to all stages of life. The project’s partners are thus anticipating to two themes of growing importance: energy efficiency and the ageing of the population.

The results and the knowledge acquired during the course of the studies are communicated to building professionals via different channels: Standards Antennas (SA), Technological Advisory Services, publications of the BBRI, information sessions and courses.

An article concerning the fire behaviour of flat roofs was published in 2014 within the framework of the SA ‘Prévention au feu’ (Fire Prevention), while the results of the acoustical studies were disseminated via actions of the SA Acoustique (Acoustics) and the Technological Advisory Services ‘Eco-construction et développement durable’ and COM-MAT.

The working groups and members of each Technical Committee are constantly exchanging information with the various target groups of the research projects to which they participate. This interaction is also decisive for the management of the project in question. As soon as a project is completed, the BBRI ensures that the results are communicated to a broad public, amongst others by incorporating the results in articles and Technical Information Notes. Published in 2014, the TIN 252 ‘L’humidité dans les constructions. Particularités de l’humidité ascensionnelle’ is a revision of the TIN 210. The theme of this TIN is closely linked to health and comfort requirements in buildings. This document wants to offer a tool to designers and contractors permitting them to detect rising damp and help them to determine the right way to treat it. It attempts to raise the awareness of professionals regarding the complexity of the diagnosis by drawing their attention to the common causes of humidity problems in buildings. This Technical Information Note also offers an overview of the existing techniques for combating rising damp and it details their potential effectiveness in practice.

Finally, like every year, over one hundred training sessions were held in 2014 regarding the themes comfort, health, accessibility and safety.

The BBRI remains very active within the standardisation networks on the national (NBN) and international level (CEN, ISO). Through its research, it strives to support the various working groups at the origin of the standardisation. The acoustics research group, for example, is working to develop a new standard describing performance criteria for hospitals, offices, retirement homes, student housing, hotels, etc. (prNBN S 01-400-3).

These criteria must guarantee a minimum comfort and be economically affordable, without however causing market distortions. The research must therefore provide constructive
Comfort, Health, Accessibility and Safety

The ‘RaDS II’ project is interesting for different working groups that deal with measurement methods and the establishment of an international system for classifying the acoustical quality of buildings.

The already-mentioned normative project ‘RaDS II’ is a good example: in addition to contributing to the international standardisation work via the integration of calculation modules into the acoustics Eurocodes 12354, it also contributes to the development of constructive solutions and the elaboration of a research-based standard. This project is also interesting for various working groups that deal with measuring methods and the establishment of an international qualification system for the acoustical quality of buildings.

The Royal Decree establishing emission thresholds for construction products in the indoor environment was approved on 8 May 2014 and published on August 28th. The RD is related to previous actions of the BBRI, primarily within the framework of the European technical committee CEN TC 351. On the normative and regulatory levels, it has long been necessary to establish emission limits both with respect to the contamination of groundwater and surface water and that of the indoor environment. This RD sets maximum emission values for dangerous or carcinogenic chemical substances contained in floor coverings. The regulation applies not only to the materials of these coverings (carpets, synthetic floors, parquets and fluid screeds), but also to the adhesives used. Limit values have thus been imposed on over 170 dangerous substances (including the best known: formaldehyde). Products exceeding these limits can no longer be put on the market after 1 January 2015. However, a transitional phase is provided for products that came onto the market before 1 September 2014: these will still be able to be sold until 1 September 2015. Maximum values will also be imposed in the future on wall and ceiling coverings. Belgium is the third Member State of the European Union to impose limits with regard to harmful emissions from construction materials.

Safety is obviously an important element throughout the execution of works. This aspect is at the centre of the new prenormative project STEPWiSe ‘Safety of Temporary Works’. People who perform work on a scaffolding are situated on a certain height an thus risk falling down. Furthermore incorrectly placed scaffolding can be a threat for the surrounding area. Bodily injuries and material damages are not only regrettable in human terms, but also constitute a wast of time and resources from an economic point of view.

Despite the publication of a Royal Decree in 2005 on the safety of temporary works at height, one is compelled to recognise that the standardisation on which the Royal Decree is based is incomplete and open to interpretation. Indeed, the ‘product’ standards related to temporary equipment (scaffolding, guardrails) generally refer to the NBN EN 1991-1-4 standard for the calculation of the wind load. Unfortunately, this standard is not suitable for all possible scenarios and it does not fully take into account the notion of the reliability of temporary structures, since the Eurocodes system is primarily dedicated to new structures with a calculated service life of 50 years. This leads to numerous types of different designs (with evident overdimensioning or lack of safety) and an unhealthy competition between the companies specialised in this domain, both on the Belgian and the European level.

The ‘STEPWiSe’ project intends to compensate for the normative shortcomings on this subject. The first part of the research wants to verify if the use of a tarpaulin or a net can protect against wind loads. The project is based on a full-scale measurement, wind-tunnel measurements and a CFD parametric study to determine the wind loads on scaffolding. The second part is dedicated to anchorings, mainly of temporary guardrails. The use of such systems in fresh masonry (time savings) raises questions regarding the calculations of the masonry and the subsequent execution of the works: what is the influence of the actual support conditions, what is the influence of the ambient conditions on the drying and what is the influence on the heterogeneous bending of the two masonry areas (facing bricks and interior blocks)? Bending tests will be performed on small walls in order to study these effects.
For several years now, the construction sector has seen an accelerated technological evolution under the influence of the rapid development of light structures (wooden and steel structures) and the increased attention for energy consumption and environmental impact. The innovations manifest themselves in new construction methods, new forms of architectural design and new generic constructive details, but they can also be of an industrial nature.

Fire safety and acoustical insulation have given rise to several interesting industrial innovations in terms of comfort, health, safety and accessibility that were developed by the BBRI in collaboration with the industry. We describe a few examples below:

• an extensive study was carried out within the framework of the ‘STAR’ project in order to develop new light facades presenting improved thermal insulation. Fire safety, stability and acoustical insulation constitute the other main challenges. The traditional solutions for prefabricated elements are characterised as particularly weak in terms of acoustical insulation performances. On the basis of an extensive testing programme performed on over 30 structures of 10 m², two new systems were finally developed and optimised on certain aspects: thermal insulation, airtightness, fire safety, stability and possibility of prefabrication. Since their acoustical insulation was better compared to the traditional solutions (difference of at least 15 dB), these systems are ideal for the renovating of facades of buildings in busy urban areas or along important transport roads

• the development of a system of acoustical insulation for wooden floors constitutes another innovation of the ‘STAR’ project. Many old town houses that are now being split up into apartments, have wooden floors that transmit airborne noises (voices, television, etc.) and footfall impact noises. The existing solutions require interventions on both sides of the floor, which are not feasible in most cases. The bottom side is often inaccessible for aesthetic reasons (ceilings adorned with beautiful mouldings) or because the apartment below belongs to a different owner. The raising of the floor the level on the top side inevitably lead to problems with the doors, the radiators, the windows, ... The new system does not require any interventions on the bottom side and makes it possible to obtain results that are significantly better than the traditional solutions. The raise of the floor level on the top side is limited to maximum 4 cm, which causes less problems related to the use of windows or doors

• finally, the ‘DO-IT Houtbouw’ project led to the development of an innovative prefabricated system for the construction of apartments with excellent thermal, acoustical and fire safety performances. This generic system, which has been described in the CSTC-Contact no. 42 (2014/2) and in various international publications, can be applied by all manufacturers.

Innovation is unquestionably a subject that receives a lot of attention. An accessibility testing system was finalised at the University Hospital of Brussels in 2014 within the framework of the Groen Licht Vlaanderen 2020 project that was carried out over a six-year period. In the complex environment of a hospital, where visitors systematically end up heading in the wrong direction, luminous signs were tested to determine whether they made it easier to find the desired department. Innovative lighting techniques were used in different configurations. A description of the test setup and the research results can be consulted in the final report. Furthermore, a test setup for stairways is also being prepared. The visibility of stairways is partly determined by the interaction between lighting and contrasts. This research subject complements the spreadsheet for the calculation of contrasts that was fine-tuned in 2014 and will be put online in the course of 2015.
Building Materials and Systems

Over the last decade the construction sector has shown itself to be particularly innovative. Materials and execution techniques are developing rapidly, in order to create new construction possibilities and reduce the environmental impact of buildings, while controlling the final cost and respecting the constructive requirements (thermal, acoustical, fire safety, etc.).

With nearly 16 million cubic metres used each year, concrete remains an emblematic construction material. In 2014 the BBRI took various actions that enabled it to study the multiple facets of this material while integrating its energy character. These actions include the projects linked to sustainable development, and amongst others CemCalc, whose objective is to develop new ternary cements with a high limestone content. The production of clinker, the principal component of cement, releases a large quantity of CO\textsubscript{2}. Replacing a part of this material with slag, fly ash and/or calcareous fillers would thus be a way to reduce the environmental impact of cement. The first biennial of this research generated encouraging results in terms of both mechanical strength and durability performances of the low slag-content cement-made concretes containing up to 25% limestone. The second biennial is focusing on ternary cements having a high limestone content and low fly ash content.

Building systems are also evolving. Wood-frame structures are undergoing unprecedented development and are attracting interest from both professionals and private individuals, notably because of their energy-neutral and sustainable character. The BBRI is fully contributing to this trend via various studies evaluating the performances of this type of structure. The OPTIDUBO research is seeking to optimise the composition as well as the implementation and use conditions of wooden building systems, in order to guarantee their initial performances and their biological durability over time. The durability and performances also depend on the choice of materials (type of insulation, nature of the air and vapour barrier, etc.) and of the care given to the execution. Various wooden constructions (facades, roofs and floors) are being subjected to long-term testing under outdoor conditions in order to assess their hygrothermal behaviour. The full-scale tests are compensated with laboratory tests and digital simulations.

Blowing in loose insulating material is a common insulation method for wood-frame structures. To guarantee the thermal performance, it is crucial that this technique is executed correctly. In this context, the prenormative research DEFISOL focuses on a test method to evaluate the potential collapsing of these insulating materials in vertical walls when they are subject to various stresses.

With regard to technical details, the WASh research studies (amongst other things) the effectiveness of different sealing systems for concrete structures. The cast wall-cast wall and cast wall-slab junctions are receiving particular attention in order to propose a new classification of these systems according to the impermeable concrete classes defined in the NBN EN 1992-3.
Like any building system, a wooden construction project must be carefully studied, all the more so if it involves the construction of average-height buildings entailing a series of challenges that must be successfully resolved: edifice stability, fire safety, acoustics, thermal comfort, etc. The sector is waiting for technical details that fulfil all these requirements, even if they present constructional nodes. It is in this context that the BBRI in 2014 continued its active participation in the VIS research DO-IT Houtbouw. Bringing together experts from a variety of disciplines, it is striving to provide the sector with technical details that are optimised for all the requirements of multi-storey wooden structures: acoustics, fire safety, stability, hygrothermal performances, airtightness, air quality, etc. In 2014, new innovative solutions which comply with the strict acoustical and fire safety requirements were developed for wooden facade coverings and facades and floors in wood-frame constructions. Fire resistance tests have made it possible to develop a solution for the junction between a wooden façade and a concrete floor that meets the applicable requirements for buildings taller than 25 metres.

We conclude with the Optimberquake project (www.optimberquake.eu) which made it possible to highlight solutions for floor-wall junction details that ensure lateral stability (under wind or seismic loads) in multi-storey structures. Despite its interesting potential, this type of construction is still rare in Belgium.

Amongst the methods for the energy renovation of facades, renderings on external insulation (ETICS – External Thermal Insulation Composite Systems with Rendering) continue to receive special attention from the BBRI, in particular with the conditions for the application on wood-frame structures. In addition to these systems, there is currently a growing interest in the use of various types of hard coverings glued on site onto insulation (terracotta bricks, ceramic tiles, natural stone or agglomerated stone). In light of these building techniques, the BBRI continued its research activities in 2014, amongst others through a study related to innovative systems (Innov-ETICS research in the Brussels-Capital Region) and a technology transfer action (Gevisol-ETICS).

While the thermal insulation of facades is essential to the energy renovation of existing buildings, it is also important to use joined elements (windows) with improved energy performance. Increasing the thermal performances of joineries can, in certain cases, entail a reduction of the other essential performances that the joineries also need to fulfil. Moreover, it is necessary to guarantee the performances over the years in order to support a durable renovation policy.

Information and training devoted to building materials and systems are still at the centre of the Institute’s programme of activities. After a great deal of work, the updating of TIN 217 ‘Ferraillage du béton’ was finally completed and it put the new standards of this subject into practice.

Concrete-related projects include the Betonic@ project (www.betonica.be) whose goal is to disseminate digital information about concrete by means of e-learning modules, webinars and a specific documentary database. Another
Building Materials and Systems

project intended to familiarise contractors with innovative concretes (self-compacting concrete, fibre concrete, ecological concrete) is entitled FUTURE CONCRETE ‘Stortklaar beton voor de toekomst’. The potential of these concretes was demonstrated live at three events and three practical start-up kits were published. The core of the project’s action is even more pragmatic, since individual assistance was provided on no fewer than 32 worksites since the project began. Self-compacting concrete is also envisaged as a mature technology of ready-to-use concrete within the framework of the SCC project ‘Stortklaar zelfverdichtend beton – Naar een optimale integratie in het bouwproces’ which studies in greater detail the impact of using this type of concrete on costs and planning.

In recent years, the BBRI staff has also been confronted with many cases of delamination of the upper layers of concrete industrial floors. The Institute focused on the problem at the behest of the ‘Rough Structure and General Contractor’ Technical Committee as well as of the Fédération des polisseurs (Federation of Polishers). The FLOORCRETE research highlighted the fact that some additives, under certain conditions, can cause air entrainment in the concrete and increase the risk of delamination of the upper layer. These results, combined with recommendations on the implementation, are currently being integrated into the TIN 204 revision project.

The problem of the aesthetic aspect of concrete is also another point that calls for the BBRI’s attention, since demand for exposed concrete is growing. This has consequences for the acceptance of works, and therefore it was crucial to establish specific recommendations on this subject (which are currently being drafted in a TIN). Nevertheless, some points remained problematic, this is the reason why the study Béton apparent et béton décoratif : exigences pour l’exécution et procédures d’évaluation was initiated. The main objective of this project is to contribute to the development of normative documents on the subject through four specific strands of research:

- requirements for concrete and formwork
- reliable analysis techniques
- establishment of evaluation criteria
- application of statistical analysis to the measurement results.

Within the framework of a joint BBRI-SBR/CURnet committee, the Institute continued preparing a manual concerning ‘soil mix’ walls. This manual integrates the observations of the collective research on ‘soil mix’ undertaken by the BBRI in collaboration with the ABEF and the University of Leuven. It determines the possible applications of the ‘soil mix’, the preconditions and the requirements relating to quality control, for both temporary and permanent applications. Furthermore, a new design method was developed for this specific material which permits, under strict conditions, to take into account a (limited) interaction between the reinforcement profiles and the ‘soil mix’, through which the use of steel can be optimised.

The constant increase in the automobile fleet as well as the number of hypermarkets and shopping centres results in an increasing need for parking spaces. The conversion of flat roofs into roof car parks offers an interesting solution in this context. While conventional flat roofs form the object of numerous reference documents and notably of several TIN’s, the literature on roof car parks is a lot scarcer. The BBRI filled this gap with the publication of TIN 253 in 2014, offering a first volume dedicated to the stresses, the design principles and the compositions of this kind of roof.

Finally, the Standards Antennas (SA) of the BBRI are still doing a great deal of work to inform SME’s from the construction sector about the normative evolutions on the Belgian and European levels. Based on their experience, the action of the SA’s sometimes also leads to the development of innovative products.

With the emergence of so-called ‘natural’ insulating materials a quality framework must be set up in order to guarantee the required performances of the materials and the quality of the created structures to contractors. Within this context, the aforementioned ‘OPTIDUBO’ research also focused on developing a test for determining the resistance of natural insulating materials to biological agents. The DEFISOL prenormative research also falls within this context. Many types of thermal insulating materials used in different parts of the building not only play a filling role, but are also subject to stresses (variable loads on floors, solar panels and vehicles on roofs, wind and vibrations in vertical walls, etc.). These studies, prompted by the lack of criteria
for evaluating the non-thermal performances of insulating materials (mechanical strength, durability, etc.), seek to identify and quantify these stresses and the admissible deformations depending on the application. The TETRA Geïsoleerde binnenvloeren (Insulated indoor floors) project supplements this research regarding the more specific application of floor insulation.

In 2014, the prenormative research GARDE-CORPS ‘Prescriptions normatives pour la conception des garde-corps des bâtiments’ was initiated. This research intends to establish a quality framework for designing the guardrails for buildings. The objective is to adapt the current standard by specifying the method and the evaluation criteria for guardrails, but also to complement the prescriptions concerning their fixation and the requirements relating to glass guardrails.

With regard to concrete, in addition to the development of steel fibres, significant evolutions have been made in recent years in the area of alternative materials, and more particularly of synthetic fibres. Their scope of application has also expanded, ranging from projects on solid ground, where the level of robustness is less important, to applications developed for sectors that are more demanding in terms of reliability. The POLYFIB project attempts to respond to the various fundamental questions that this type of fibres raises in order to improve the standardisation from the perspective of its characterisation, its influence on green concrete (guaranteed workability) and its long-term mechanical performance in concrete (durability and long-term stresses).

Since several months now the BBRI has been focusing more specifically on the reliability of temporary or auxiliary structures such as scaffolding or certain types of guardrails. A lot of grey areas exist with regard to verifying the safety of this type of structure, depending on the nature of the exerted stresses. Indeed, these structures are sometimes less resistant to wind and other impacts, compared to what is generally recommended for a building. Certain ‘product’ standards sometimes conflict with the calculation standards (Eurocodes) to which they refer. Furthermore, the influence of certain configurations is not correctly taken into account: the space between the scaffolding bars, reduced safety factors, influence of wire mesh or tarps on the wind exposure of the scaffolding, etc. The STEPWiSe project is striving to develop a common approach in order to determine the reliability of this kind of construction via full-scale measures, numerical CFD simulations and wind tunnel tests.

Finally, the BBRI still plays an important role as a catalyst for innovation through various actions such as the Technological Advisory Services. The Technical Advisory Service COM-MAT ‘Matériaux et techniques de construction durables’ (www.com-mat.be), subsidised by the Walloon Region, brings together seven research centres to focus on 10 priorities, divided up in three specific pillars, in order to support SME’s in the construction sector with the development and realisation of innovative ideas. The first pillar concerns, on the one hand, the primary materials used in the construction of buildings and road infrastructures (concrete, wood, steel, glass and road coverings) and, secondly, their processing techniques. The second pillar targets the renovation and repair of existing building in Wallonia, more specifically in order to improve the energy performances. The third pillar focuses on acoustical insulation and the integration of renewable energies into technical installations.

Within the framework of the prenormative projects Soutènements and MICROPIEUX, the BBRI continued its work on the development of new methods of measurement based on optical-fibre technology. These new methods make it possible to instrument and intensively measure the foundation and structural elements. These techniques were implemented on a real site in order to be able to observe the exerted stresses on the elements.

Technologieën voor het meten, communiceren en sturen op de werf van de toekomst, that is the ambition of another project which encourages major innovations on worksites by raising the sector’s awareness of new technologies. This project focuses more specifically on the most effective technologies (laser, stations, [d]GPS, etc.) for machine control and the possibilities of assistance by means of control signals in a 3D environment (sensors, adapted software programs). These techniques will make it possible for example to replace the manual measurement of distances or levels on large worksites, in particular in the context of excavation works in civil engineering, the construction sector and road construction.
The correct adjustment of a ventilation installation is essential for its proper functioning. Human beings construct buildings to be able to live, work, teach, care, relax in them. They spend more than 70% of their time in these buildings which are far more than just an envelope protecting from the outside world. Therefore a lot technical installations are present to guarantee an adapted indoor climate, which do not only need to be high performing but also energy efficient and environmentally friendly.

The constant evolution of the thermal performances of buildings (insulation and air tightness) make it imperative to continually adapt our technical installations (heating, cooling, ventilation, lighting and sanitary), which become increasingly complex and performant. The research focuses on this development and thus attempts to encourage installers to use new techniques.

The Smart Geotherm research (www.smartgeotherm.be) focuses on the different possibilities for using geothermics in order to heat buildings. In this context, the BBRI conducted studies on the retention of heat and cold in the building’s structure, on the application of heat pumps and on the advanced management of heat supply and demand.

Ventilation installations received particular attention in 2014. The purpose of the new PRE-VENT research is to develop the necessary scientific bases in order to stimulate the future evolution of performance criteria and design rules for ventilation systems in buildings.

Flows, adjustment and ventilation on demand are the subjects being investigated within the framework of this project, which moreover studies hybrid systems presenting an interesting potential in terms of air quality and/or reduction of energy consumption. Special attention is also being paid to innovative ventilation systems.

In the area of sanitary installations, a large-scale measurement campaign conducted within the framework of the Tetra project Eau chaude sanitaire (Sanitary Hot Water) (www.tetra-sww.be) enabled us to get a better view on the real peak consumption of sanitary hot water. These peak flows are often overestimated in the calculation rules and draft standards, which generally leads to a substantial overdimensioning of the installation. The VIS project Instal 2020 deals with the execution of high energy-performance installations for sanitary water (hot and cold) and central heating. It is seeking to develop a method of integrated optimisation for designing and implementing these installations, for both new and renovated dwellings. An optimal design encompasses the choice of the concept and the dimensioning, taking into account such notions as energy, comfort, hygienic water quality and overall cost.

A better understanding of the demand for water will enable a more precise dimensioning of these installations, without any loss of comfort, and it will encourage the rational use of potable water.

The use of natural lighting and the implementation of advanced systems for the smart management of low-energy consumption lighting offer great possibilities for development. Indeed, for several years now LED (light emitting diodes) technology has triggered a genuine revolution in the world of lighting. This revolution has advanced very rapidly and is now extending to the functional applications of indoor lighting. The projects SMART LED and Groen Licht...
Vlaanderen 2020 (www.groenlichtvlaanderen.be) address various aspects of this type of lighting. The IEA 50 project (Advanced Lighting Solutions for Retrofitting Buildings, www.task50.iea-shc.org) encourages actions to renovate lighting installations, including by means of a demonstrative section on the buildings of the BBRI. It strives to identify synergies on the international level.

The execution and installation of technical installations can influence both the performances of the installation and those of the building’s envelope. For example, an excessive number of bends in a ventilation installation can reduce its intrinsic performances. Similarly, poorly-designed conduit feedthroughs or incorrectly fastened systems (solar panels or others) can impede the finishing of the technical details and reduce the performances of the entire building (watertightness, air and vapour impermeability and noise insulation). Therefore it is important to pay attention to these too-often neglected aspects.

Programmes for the energy renovation of existing buildings are no longer limited to the building’s envelope. The heating, ventilation and lighting installations are often treated at the same time.

The RENOFASE project (www.renofase.be) is aimed at finding solutions for the different renovation phases, which make it possible, for example, to integrate the technical installations into the building’s envelope.

In several Belgian cities, information sessions were organised on the evolutions in sanitary technology. The closing information session of the ‘Eau chaude sanitaire’ project was a great success (attracting over 140 participants). The various information sessions on the lighting evolutions, organised within the framework of the Technological Advisory Service Eco-construction et développement durable of the Brussels-Capital Region, of ‘Cap 2020’ (Master Class on ‘lighting’) and of the ‘SMART LED’ project, interested a broad public (nearly 450 participants in all). In total more than 50 training courses were devoted to technical installations (including the training session on heating and ventilation).

Explanatory videos were also put online in order to help contractors use the Optivent calculation tool (www.optivent.be) making it possible to dimension a ventilation system from its design all the way to its commissioning.

Several articles directly linked to research projects were published in CSTC-Contact both on the systems (hybrid heat generators, availability of sanitary hot water) as well as on their maintenance (for example ventilation systems). Other articles focused on the environment (quality of rainwater, role of brass parts in the corrosion of conduits).

The quality of the execution is crucial if the performances of technical installations are to meet users’ expectations. Construction Quality, BCCA and QUEST are therefore collaborating in order to establish a quality framework for the different techniques: drafting of STS’s (Technical Specifications) relating to ventilation, application of a labellisation of certified companies in the renewable energy sector (solar water heaters, photovoltaic installations, heat pumps, ventilation with heat recovery) and the introduction of a certification system (after training and examination) for installers of renewable energy systems.

Several actions to support innovation were conducted within the framework of the Technical Advisory Service COM-MAT ‘Matériaux et techniques de construction durables’. These actions concern the use of renewable energy in technical installations (use of ice as an energy source for heat pumps, combined production of electricity and hot water in photovoltaic panels) as well as other problems linked to innovative systems (use of microprocessors for heating purposes, integration of innovative heat pump systems into very high energy-performance buildings).
Technical and Organisational Assistance

Technical Assistance

There’s no getting around it: modern buildings have to meet a growing number of performance requirements aimed at guaranteeing maximum comfort for their occupants. These requirements concern not only the stability, durability and watertightness of the structure, but also aspects such as its thermal and sound insulation, airtightness, fire safety and accessibility. Since these requirements are becoming increasingly strict, it is vital that companies be as flexible as possible in order to be able to take these changes into account.

The performances to be reached are described in various regulations and standards (EPB regulation, basic fire prevention standards, etc.) and often depend on parameters that are specific to each project (ambient noise near railway lines or airports, etc.), the intended use and the owner’s wishes. The result of all this is a multiplication of new techniques and materials, each requiring an appropriate implementation. For more information on the subject, professionals can usually consult the technical documentation of the products concerned, the specifications and the BBRI’s publications.

However, the building professionals sometimes need more personalised assistance. The construction process has been the subject of such a plethora of publications that even the best search engines do not always come up with the desired information. In addition, since certain answers are inconclusive, it is sometimes necessary to compare several documents, with all the problems of interpretation that this entails. Moreover, high-performance buildings can pose challenges for which no standardised approach is currently available and which require a specific response.

This is precisely the task of the BBRI’s ‘Technical Advice and Consultancy’ (TAC) department, which is available in order to help the actors of the building sector.

In 2014, the engineers of the ‘Technical Advice’ division (ATA) handled more than 11,000 questions via the telephone helpdesk and received over 10,000 e-mails. Moreover, nearly 1,000 cases required on-site visits in order to make findings and/or perform tests on the spot. During these oral and written contacts, the engineers strive not only to provide the professionals with the right information as quickly as possible, but also to improve their knowledge so as to increase the quality of the structures in their entirety and enable the sector to construct the requested high-performance buildings.

The questions posed are an important source of feedback, enabling us to identify recurrent problems that affect the sector, but also the shortcomings that still characterise the available information and techniques. It goes without saying that this information is intensively used in order to improve
Technical and Organisational Assistance

This working method permits the BBRI to publish articles that match the users’ needs and organise training courses meeting that respond to the specific demands of the sector. Moreover, the engineers of the ‘Technical Advice and Consultancy’ department are represented in various Technical Committees and working groups and participate in many research projects: development of execution details within the framework of the constructional nodes issue and projects such as ‘FLOORCRETE’, ‘Betonic@’, ‘RENOFASE’ and ‘Luchtdicht bouwen van A tot Z’.

Organisational Assistance

The current economic situation and the growing number of performance requirements imposed on both new structures and existing buildings force contractors to pay constant attention to the organisation and profitability of their activities. Indeed, a proper use of new materials and techniques often requires adapting the organization and coordination of the works.

Since the demand for financially affordable housing is growing steadily, it is not surprising to see themes such as profitability or lean construction gaining in importance. However, a thorough optimisation of the entire construction process is required in order to reduce construction costs, and the engineers and economists of the ‘Management, Quality and Information Technologies’ division (GEBE) have taken this issue to heart.

The BBRI has also developed its expertise in calculating cost prices, thanks to the financial analysis of construction companies. This should enable companies to correctly interpret their annual figures (liquid assets, solvency, profitability and added value of certain projects) and thus make informed decisions about their management. However, the analysis of annual accounts should not be limited to the internal organisation, but can also be applied to other intervening parties (subcontractors, suppliers, customers, etc.). The feedback from construction companies enabled the BBRI to continue developing the service and the training courses on this subject.

Financial impact, company organisation, quality and lean construction are currently at the centre of numerous research projects and seminars, in which the ‘Management, Quality and Information Technologies’ division of course actively participated.

After the approval of the revised version of the ISO/DIS 9001 standard, our engineers and economists also contributed to several information sessions on the subject of this standard and its impact on construction companies.

The teaching module CPRO©, developed by the ‘Management, Quality and Information Technologies’ division and which can be downloaded free of charge from www.cstc.be/go/cpro, was used frequently by SME’s in 2014, thus permitting them to more easily apply management principles in their daily practice. An in-depth analysis of their expectations made it clear that a new version of the program was necessary, so this module was given a makeover as well as several additional functionalities. Functioning from the cloud and available for all operating systems, this new version no longer requires installation, which eliminates any compatibility problems. All that is needed are a computer and an internet connection. After a long test period, this application is scheduled to be launched in 2015.

Finally, our employees individually advised more than 150 companies and organised no fewer than 200 training courses addressing such flagship themes as cost price calculation, financial analysis of construction companies and the importance of the planning of projects and resources.
Associations of the BBRI

The BBRI participates in the works of numerous associations linked to construction and it even contributed to the founding of some of them. Dedicated to several specific construction activities, these institutions always give the priority to providing support for companies.

Recywall
The mission of Recywall (www.recywall.be) is to help companies to valorise and recycle their wastes. In 2014, the close collaboration continued with the establishment of a polycentric Technology Advisory Service, subsidised by the Walloon Region, of which the BBRI is a part.

Tradecowall
The objective of this company is to find solutions for the treatment of inert wastes and excavation soils coming from construction and demolition worksites (www.tradecowall.be). In 2014, new possibilities for valorising construction wastes were studied: together with the BBRI, Tradecowall initiated a research project on the valorisation of washed sands.

Belgian Construction Quality Society (BCQS)
BCQS (www.bcqs.be) trains and advises professionals involved in a labellisation and/or certification process (management of quality (ISO 9001), safety (VCA) and the environment (ISO 14001), for example). Privileged partner of BCCA and Construction Quality, BCQS also assists companies that have signed up for the quality programmes set up by these two associations.

Belgian Construction Certification Association (BCCA)
BCCA (www.bcca.be) is one of the Belgian leaders of certification in the construction sector and holds, thanks to this status, an accreditation from the BELAC office. For several years now, this non-profit organisation has been supporting the collective ‘Construction Quality’ label and has regularly performed production inspections within the context of the CE marking.

Belgian Centre for Domotics and Immotics (BCDI)
The BCDI (www.bcdi.be) defines itself as a study and information centre in the field of home and building automation. Themes such as personal assistance, smart cities and intelligent buildings are also part of the BCDI’s expertise. In recent years, this centre has collaborated on many national and European research projects as well as participated in various congresses, forums and workshops.

CentrumDuurzaamBouwen (CeDuBo)
Thanks to the renewal of its exhibition and the organisation of various seminars and training courses, CeDuBo (www.cedubo.be) remains the reference centre for sustainable construction for both building professionals and the general public. In addition, it coordinates the transition network Duwobo (www.duwobo.be) and it participated in the creation of the Dubolimburg support platform (www.dubolimburg.be) and Duwolim (www.duwolim.be), a local entity intervening in the eco-credits.

Organisatie voor Duurzame Energie (ODE-Vlaanderen)
As a coordinating body for sustainable energy in Flanders for more than 15 years, ODE (www.ode.be) ensures the consultation between companies and organisations in the field of renewable energy and the public authorities through thematic platforms: heat pumps, photovoltaics, biomass, wind energy, ‘green’ electricity, heating networks, etc. The BBRI is responsible for their integration in buildings.

Quality Centre for Sustainable Energy Technologies (QUEST)
QUEST (www.q4q.be) drafts, together with the construction sector, Construction Quality and BCCA, quality procedures and technical reference documents for the application of small renewable energy systems (heat pumps, thermal and photovoltaic solar installations, ventilation systems with heat recovery, etc.). QUEST is also the official representative for the certification of renewable energy system installers.

Vlaanderen Bouwt (VLABO)
VLABO (www.vlaanderenbouwt.be) sets up, with the technical support of the BBRI, construction projects to create durable, high-quality housing for local authorities while monitoring over the urbanistic, architectural and technical qualities of the design and its costs.
The activities of the BBRI are oriented by thirteen Technical Committees. Eleven of them directly represent a branch of the construction industry and are composed essentially of contractors. The other Committees focus on subjects of interest to several branches. In order to guarantee this bottom-up approach, each Committee defines the actions that will be taken the following year, via working plans submitted for approval to the Standing Committee of the BBRI.

**Technical Committees**

**Rough Structure and General Contractors**
- **Chairman**: X. Braet
- **Engineers-leaders**: N. Huybrechts, B. Parmentier
- **Engineers TAC**: C. Aerts, S. Vercauteren, J. Wijnants

**Heating and Climate Control**
- **Chairman**: D. Peytier
- **Honorary chairmen**: R. Debruyne, G. Ledoyen
- **Engineers-leaders**: C. Delmotte, P. Van den Bossche
- **Engineers TAC**: I. De Pot, V. Jadinon

**Paintworks, Flexible Wall and Floor Coverings**
- **Chairman**: J. Meuleman
- **Engineers-leaders**: E. Cailleux, E. Nguyen
- **Engineer TAC**: G. De Raed

**Hard Wall and Floor Coverings**
- **Chairman**: P. Goegebeur
- **Engineer-leader**: T. Vangheele
- **Engineers TAC**: L. Firket, J. Van den Bossche
Glazing

Chairman
A. Sanchez

Members

Engineers-leaders
V. Detremmerie, E. Dupont

Engineers TAC
F. Caluwaerts, L. Lassoie

Sealing Works

Chairman
J. Coumans

Members

Engineers-leaders
E. Mahieu, E. Noirfalisse

Engineer TAC
E. Mahieu

Roof Coverings

Chairman
G. Pierrard

Members

Engineers-leaders
F. Dobbels, D. Langendries

Engineers TAC
L. Geerts, E. Mahieu, O. Vandooren

Sanitary and Industrial Plumbing, Gas Installations

Chairman
A. Dooms

Members

Engineers-leaders
B. Bleys, K. De Cuyper

Engineers TAC
I. De Pot, V. Jadinon

Joinery

Chairman
M. Collignon

Members

Engineers-leaders
S. Charron, V. Detremmerie, Y. Martin, B. Michaux

Engineer TAC
G. De Raed
Technical Committees

Stone and Marble
Chairman
H. Vanderlinden
Members
Engineers-leaders
V. Bams, D. Nicaise
Engineers TAC
L. Firket, J. Van den Bossche

Plastering, Jointing and Facade Works
Chairman
J. Van den Putte
Members
Engineers-leaders
Y. Grégoire, A. Smits
Engineers TAC
S. Eeckhout, S. Watthy

Hygrothermy
Chairman
E. De Kempeneer
Members
Engineers-leaders
X. Loncour, L. Vandaele
Engineers TAC
A. Acke, J.-M. Rostenne

Acoustics
Chairman
E. De Kempeneer
Members
Engineer-leader
L. De Geetere
Engineer TAC
S. Vercauteren

Architects
Chairman
M. Proces
Members
Engineers-leaders
D. Langendries, P. Wouters
The BBRI strives to improve the quality in construction and strengthen the skills of the professionals of the sector. This task is far from being an easy one, considering the fragmentation of the building process and the diversity of the partners involved.

To accomplish its mission and anticipate technological developments, the BBRI can rely on a dynamic and multidisciplinary team. Our staff thus ensures that the fruits of the scientific and technical research conducted by the Institute benefit building contractors, but also other professionals of the sector (architects, consultancy offices, surveyors, education, administrations, etc.).

The experience and the pragmatism of some staff members combined with the innovative vision of others enable the Institute to publish practical works, to provide custom-tailored technical advice as well as to organise courses and training sessions that meet the real needs of the sector.

Given the growing complexity of those needs and the increased interest in areas such as sustainable construction and renovation, finishing techniques, energy and indoor climate, IT applications in construction as well as the accessibility of buildings, the BBRI expanded its staff numbers to a total of 245 employees in 2014.

The BBRI bases itself on the expertise of more than 240 staff members coming from a wide range of disciplines. This combination of professional skills, commitment and versatility helps to make the Institute the authorised body that it has become within its sector.
The accounting department seeks to give an accurate overview of the Institute’s financial situation and to motivate the decisions taken with regard to management.

**Affiliated members**

On 31 December 2014, the BBRI had 84,249 members, including 56,652 one-man businesses. The graph below shows that this number increased by 24.34% over the course of the past ten years. If we take the index into account, the increase in fees collected for this period amounts to 18.47%.

**Revenues and expenditures**

The bar graphs at the top of the following page illustrate the evolution of the various revenues and expenditures relative to the total over the last three financial years. One thus finds that the fees of the members represent some 54% of the total revenues. Personnel costs – the most important item of all expenditures – have fluctuated between 65 and 67% over the past three years.
### Destination of the expenditures

The diagram presented below shows the revenues and the expenditures which result from the activities of the BBRI, after distribution of the structural expenses. The latter represent not only the costs relating to the buildings and equipment, but also the administrative costs. This demonstrates that the totality of the available resources benefits, directly or indirectly, the construction companies.

Indeed, if 89% of the total budget is directly invested for the benefit of the sector, 11% of that is valorised in research activities under contract which, in the long run, also benefit construction. Consequently, all of our resources are devoted to improving the quality and the competitiveness of the sector, which is ultimately the founding mission of the Institute.

#### Evolution of the revenues

<table>
<thead>
<tr>
<th>Year</th>
<th>Fees</th>
<th>Research</th>
<th>Development</th>
<th>Services</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>20%</td>
<td>30%</td>
<td>10%</td>
<td>40%</td>
<td>10%</td>
</tr>
<tr>
<td>2013</td>
<td>25%</td>
<td>35%</td>
<td>15%</td>
<td>25%</td>
<td>10%</td>
</tr>
<tr>
<td>2014</td>
<td>30%</td>
<td>40%</td>
<td>20%</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>

#### Evolution of the expenditures

<table>
<thead>
<tr>
<th>Year</th>
<th>Personnel</th>
<th>Goods</th>
<th>Supplies</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>25%</td>
<td>20%</td>
<td>15%</td>
<td>40%</td>
</tr>
<tr>
<td>2013</td>
<td>30%</td>
<td>30%</td>
<td>10%</td>
<td>30%</td>
</tr>
<tr>
<td>2014</td>
<td>35%</td>
<td>35%</td>
<td>15%</td>
<td>20%</td>
</tr>
</tbody>
</table>

#### Finances

<table>
<thead>
<tr>
<th>Category</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fees of the members</td>
<td>53.75%</td>
<td>53.75%</td>
<td>53.75%</td>
</tr>
<tr>
<td>Other Revenues</td>
<td>46.25%</td>
<td>46.25%</td>
<td>46.25%</td>
</tr>
</tbody>
</table>

#### Expenditures: destination

- **Technical advice, courses, publications databases**: 29.48%
- **Thematic Innovation Stimulation projects, Technological Advisory Services, Standards Antennas, studies, awareness-raising**: 12.63%
- **Innovative collective research**: 18.06%
- **Prenormative collective research**: 8.12%
- **Functioning of the laboratories**: 9.15%
- **Standardisation, Certification, Technical Approvals**: 5.44%
- **Others**: 6.57%
- **Research under contract**: 10.55%
During the meetings of the General Council of the BBRI on 29 April 2014 and 25 November 2014, the composition of the General Council and the Standing Committee was approved as follows:

### General Council

**Chairman**  
J. Gheysens

**Vice-chairmen**  
J. Coumans, V. Favier, C. Golinvaux

**Honorary Chairmen**  
E. Goes, R. Lenaers

**Members appointed by the Confédération Construction**  

**Members coopted by the Confédération Construction**  
V. Favier, B. Gilliot, C. Peeters, Y. Pianet, J. Willemen, B. Zanardini

**Members appointed by the Bouwunie**  

**Member appointed by the FEB**  
J. Coumans

**Members appointed by the Federal Public Service Economy**  
F. Debuyst, H. Dumont

**Member appointed by the Walloon Region**  
P. Villers

**Member appointed by the Brussels-Capital Region**  
O. Eugene

**Members appointed by the Flemish Region**  
D. Otte, L. Van De Loock

**Members appointed by the employees’ organisations**  
K. Collyns, P. Cuppens, P. Franceus, J. Staal, J. Vandycke

### Standing Committee

**Chairman**  
J. Gheysens

**Vice-Chairmen**  
J. Coumans, V. Favier, C. Golinvaux

**Members**  

**Observers**  
D. Otte, P. Villers

**Account Inspectors**  
J. Lembrechts, B. Tasiaux

**Statutory Auditor**  
HLB Dodémont-Van Impe & C°
Energy and Environment

3D Restauratie – Nieuwe vormgevingstechnieken voor metaal-, steen- en pleisterwerkrestauratie (New execution techniques for the restoration of metal, stone and plastering) (IWT - Flanders)

AIM-ES – Hoogefficiente renovatie van (semi-)identieke stedelijke woonwijken: Ervaringsgebaseerde richtlijnen voor geindustrialiseerde multifunctionele gevelschil-renovatiesystemen (Highly energy-efficient renovation of semi-identical urban residential quarters: directives based on experience for industrialised multifunctional facade renovation systems) (InnovIRIS - Brussels)

AN Energie et climat intérieur (Energy and Indoor Climate) (FPS Economy and NBN)

Bruxelles Greenbizz (FEDER Brussels)

Brussels Retrofit XL (InnovIRIS - Brussels)

CEAMaS – Civil engineering applications of Marine Sediments (European Union)

Construire avec l’énergie (Building with energy) (SPW DG04 - Wallonia)

DuraPerf – Durabilité des performances des éléments menuisés énergétiquement améliorés (Durability of performances of more energy-efficient joined elements) (SPW DG06 - Wallonia)

ECOREN – Energetische renovatie van Vlaamse representatieve eengezinswoningen en appartementsgebouwen (Energy renovation of representative Flemish single-family dwellings and apartment buildings) (IWT - Flanders)

Evaluation de la prestations et durabilité de la performance des fenêtres et hauteur de l’enroulement (Evaluation of the performances and durability of high-performance windows and their junction with the rough structures) (FPS Economy and NBN)

Gespecialiserde energieconsulenten voor onroerend erfgoed (Specialised energy consultants for building heritage) (Onroerend erfgoed - Flanders)

Gevisol-ETICS – Buitengevelisolatie met ETICS (ETICS) (AO - Flanders)

GT Eco-construction et développement durable (Eco-construction and sustainable development) (InnovIRIS - Brussels)

GT VALOWALL – Valorisation des déchets industriels et sols & sites contaminés en Wallonie (Valorisation of industrial waste and contaminated soils and sites in Wallonia) (SPW DG06 - Wallonia)

ISOLA 2020 – Développement d’un kit modulaire pour le marché basse énergie associant un pré-cadre et une nouvelle gamme complète de menuiserie en bois (Development of a modular kit for the low-energy market associating a pre-frame and a new complete range of wood joinery) (SPW DG06 - Wallonia)

LC Build – Evaluation of retrofitting concepts from a life cycle perspective (InnovIRIS - Brussels)


LOWEMI – Peintures à très faible taux d’émission de composés volatils (Paints with very low emissions of volatile compounds) (SPW DG06 - Wallonia)

Luchtdicht bouwen van A tot Z (Airtight construction from A to Z) (AO - Flanders)

MEASURE – Mesure de performances réelles et de Satisfaction des occupants dans les bâtiments Résidentiels à hautes performances Energétiques (Measurement of the real performances and the satisfaction of the occupants in high-performance residential buildings) (SPW DG04 - Wallonia)

PERFECT – Caractérisation in situ des performances énergétiques réelles de l’enveloppe du bâtiment (On-site characterisation of the real energy performances of the building’s envelope) (FPS Economy and NBN)

PROSOLIS – Etude des caractéristiques énergétiques des PROtections SOLaires et de leur Impact sur la perception visuelle des utilisateurs (Study on the energy characteristics of shading devices and their impact on the visual perception of the users) (SPW DG06 - Wallonia)

RECYDESA – Recyclage de déchets de construction inertes : développement par lavage, de sables et microgravés à destination des chapes et bétons (Recycling of inert construction wastes: development by washing of sands and microgravel intended for screeds and concretes) (SPW DG06 - Wallonia)

RENOFASE – Stappenplan voor een kwaliteitsvolle energetische renovatie: gestroomlijnd en prestatiegericht werken (Procedures for a high-quality energy renovation: effective, performance-oriented works) (IWT - Flanders)

RenOZym – Techniques de nettoyage des façades, toitures et terrasses à l’aide de micro-organismes et d’enzymes (Cleaning techniques for façades, roofs and terraces using micro-organisms and enzymes) (SPW DG06 - Wallonia)

SMART LED – Caractérisation des performances réelles des installations d’éclairage LED (Characterisation of the real performances of LED lighting installations) (SPW DG04 - Wallonia)

STAR – Sustainable Thermal Acoustic Retrofit (European Union)

SUNROOF – Bevestiging van zonnepanelen op hellende en platte daken (Fixation of solar panels on flat and inclined roofs) (FPS Economy and NBN)

THERMOGRAFIE – Thermografie als graadmeter van de gebouwschil (Thermography as indicator of the building’s envelope) (IWT - Flanders)

Vlaams Kennisplatform Woning-Renovatie (Flemish Knowledge Platform Housing Renovation) (IWT - Flanders)

Comfort, Health, Accessibility and Safety

AN Acoustique (Acoustics) (FPS Economy and NBN)

AN Eléments de façade manuels et motorisés (Manual and Motorised Facade Elements) (FPS Economy and NBN)

AN Energie et climat intérieur (Energy and Indoor Climate) (FPS Economy and NBN)

AN Prévention au feu (Fire prevention) (FPS Economy and NBN)

Construire et rénover avec l’adaptabilité (Build and renovate with adaptability) (SPW DG06 - Wallonia)
Building Materials and Systems

AN Béton, mortier, granulats (Concrete, mortars, granulates) (FPS Economy and NBN)

AN Eléments de façade manuels et motorisés (Manual and Motorised Facade Elements) (FPS Economy and NBN)

AN Eurocodes (Eurocodes) (FPS Economy and NBN)

AN H₂O & toitures (H₂O & roofs) (FPS Economy and NBN)

AN Parachèvement (Finishing) (FPS Economy and NBN)

BESCHOEINGEN – Beschouwingen en Onderzoektechnieken. Richtlijnen voor het ontwerp, de uitvoering en de monitoring van klassieke en nieuwe systemen (Support Techniques - Rules for dimensioning, implementing and monitoring for modern and traditional systems) (FPS Economy and NBN)

CARMAT – Développement de nouveaux types de matériaux obtenus par carbonation de fractions de scories d’aciérie au moyen de fumées industrielles (Development of new types of materials obtained by carbonation of fractions of steel-mill slag by means of industrial fumes) (SPW DG06 - Wallonia)

CAP DESIGN – Encapsulation of polymeric healing agents in self-healing concrete: capsule design (European Union)

CemCalc 2 – Ciment ternaire à haute teneur en calcaire et à faible teneur en laitier (Ternary cement with high lime content and low slag content) (SPW DG06 - Wallonia)

COMPONAT – Développement de COMPOSites à base d’huiles végétales NATurelles (Development of COMPOSites based on NATural vegetable oils) (SPW DG06 - Wallonia)

Critères de résistance des bétons au gel/dégel II (Resistance criteria to frost/thaw for concretes II) (FPS Economy and NBN)

DEFISOL – Déformation des matériaux d’isolation dans le bâtiment : évaluation et critères (Deformation of insulating materials in the building: evaluation and criteria) (FPS Economy and NBN)

Duurzaamheid van fotokatalytische cementgebonden bouwmaterialen (Durability of photocatalytic cement-based construction materials) (FPS Economy and NBN)

Evaluatie van de prestaties en duurzaamheid van hoog performante vensters en hun aansluiting op de ruwbouw (FPS Economy and NBN)

Expo-Crete – Colour tone homogeneity of surfaces in exposed concrete – technical development and practical limits (European Union)

FLOORCRETE II – Délamination de la couche superficielle des sols industriels en béton – établissement des critères pour la composition du béton, la conformité et l’exécution (Delamination of the surface layer of concrete industrial floors – establishment of criteria for the composition of the concrete, the conformity and the execution) (FPS Economy and NBN)

FUTURECONCRETE – Stortklaar beton voor de toekomst (Ready-to-use concrete for the future) (AD - Flanders)
Annex
‘Projects’ Database

Geïsoleerde binnenvloeren – hedendaagse praktijk en toekomstige innovatieve trends (Insulated indoor floors – current practice and innovative future trends) (IWT - Flanders)

Generation Composite (AO - Flanders)

Gevisol-ETICS – Buitengevelisolatie met ETICS (ETICS) (AO - Flanders)

GT.COM-MAT – Matériaux et techniques de construction durables (Sustainable construction techniques and materials) (SPW DG06 - Wallonia)

GT.SUREMAT – Traitements de Surface et Révêtement actifs multi-Matériaux (Multi-material active treatments for surfaces and coverings) (SPW DG06 - Wallonia)

ID Innovation – Procédure d’évaluation technique simplifiée des produits durables innovants dans le secteur de la construction (Simplified technical evaluation procedure for innovative sustainable products in the construction sector) (SPW DG06 - Wallonia)

Innov-ETICS – Insulation composite systems with render or tiles (ETICS-R&T); technical investigations on high performance innovative solutions for the retrofitting of housing (SPE)

Metselwerk IV – Innovaties in de metselwerksector: implementeren door innovatievolger (Masonry IV – Innovations in the masonry sector: implementation through innovation monitoring) (IWT - Flanders)

MICROPIEUX – Développement d’une méthode de dimensionnement belge intégrée (Development of an integrated Belgian dimensioning method) (FPS Economy and NBN)

Morecar – Modélisation des propriétés rhéologiques du béton réfractaire (Modelling of the rheological properties of refractory concrete) (FEDER Wallonia)

OPTIDUBO – Développement et optimisation de toitures et parois à base de bois innovantes et durables dans le temps (Development and optimisation of innovative and long-lasting wood-based roofs and walls) (SPW DG06 - Wallonia)

POLYFIB – Evaluation et structurelle de l’utilisation de synthétiques macrofibres (Evaluation of the structural use of synthetic macrofibres) (FPS Economy and NBN)

QualiChEck – Towards improved compliance and quality of the works for better performing buildings (European Union)

Recybet – Ontwikkeling van een nieuwe waardeketen voor de valorisatie van betonpuin in betonproducten (Development of a new value chain for the valorisation of concrete waste in concrete products) (IWT - Flanders)

RecyBeton – Utilisation de granulats recyclés dans le béton prêt à l’emploi (Use of recycled granulates in ready-to-use concrete) (FPS Economy and NBN)

REDMONEST – Conservation des bétons anciens (Conservation of old concretes) (BELSPO)

SCE – Stort klaar Zelfverdichtend Beton (Ready-to-use self-compacting concrete) (IWT - Flanders)

SPATIODATA – Développement d’une plate-forme d’informations multimedia et spatialisées pour la gestion de bâtiments (Development of a multimedia and spatialised information platform for the management of buildings) (SPW DG06 - Wallonia)

STABILAME – Développement et optimisation d’un kit de maison bois en contre-clout en système sandwich à base de bois indigène (peuplier) (Development and optimisation of a wooden house kit in counter-nailed sandwich system based on native wood (poplar)) (SPW DG06 - Wallonia)

Tegelwerk – Naar een snellere concretisering van innovaties bij vloerbetegeling (Tiling – Towards a faster concretisation of innovations in floor tiling) (IWT - Flanders)

UITZICHT II – Uitzicht van afwerkingsmaterialen: classificatie, meetmethode en kleuraanvaardingscriteria (Appearance of finishing materials: classification, measurement method and acceptance criteria for colours) (FPS Economy and NBN)

VALOCEL – Recyclage et valorisation de déchet de béton cellulaire (Recycling and valorisation of cellular concrete waste) (SPW DG06 - Wallonia)

VETURES II – Encollage de parachèvements durs sur isolation thermique : critères performants de sélection des matériaux, de durabilité du système et prescriptions d’utilisation II (Adhesive bonding of hard finishings on thermal insulation: performance criteria for the selection of materials, the durability of the system and use prescriptions II) (FPS Economy and NBN)

WASH – Structures étanches : vers une classification performantioelle (Impervious structures: towards a performance classification) (FPS Economy and NBN)

Zicht- en sierbeton: uitvoeringsgegevens en evaluatieprocedures (Exposed concrete and decorative concrete: execution requirements and evaluation procedures) (FPS Economy and NBN)

Technical Installations

AIE.50 – Advanced Lighting Solution for Retrofitting Buildings (SPW DG04 - Wallonia)

EVA CODE – Méthode d’évaluation des performances des appareils de conditionnement d’eau destinés à prévenir la formation de tartre (Method for evaluating the performances of water conditioning equipment designed to prevent the formation of scale) (FPS Economy and NBN)

Groen Licht Vlaanderen 2020 (IWT - Flanders)

Instal 2020 – Integraal antwoord van installaties voor sanitair en verwarming (Integral design of heating installations and installations for sanitary hot water) (IWT - Flanders)

Kwalivent – Onderzoek naar een draagvlak voor het invoeren van kwaliteits-eisen voor ventilatievoorzieningen (Research into a support basis for introducing quality requirements for ventilation equipment) (VEA - Flanders)

Sanitair Warm Water – Selectie en dimensionering van productie en distributie (Sanitary hot water – Selection and dimensioning of the production and distribution) (IWT - Flanders)

Smart Geotherm – Mobiliseren van thermische energieopslag en thermische inertia in grondkoppeld concepten voor de slimme verwarming en koeling van/middelgrote gebouwen (Mobilisation of thermal energy storage and thermal inertia in systems coupled with the ground for smart heating and cooling of tall and medium-sized buildings) (IWT - Flanders)

SUNROOF – Bevestiging van zonnepanelen op hellende en platte daken (FPS Economy and NBN)
Research • Development • Information

Primarily financed by the membership fees of some 85,000 Belgian companies, representing virtually all of the construction trades, the BBRI has been considered for more than 50 years as one of the leading scientific and technical institutes, contributing directly to the improvement of quality and productivity.

Research and innovation
The introduction of innovative techniques is vital for the survival of an industry. Oriented by the construction professionals, contractors and experts sitting in the Technical Committees, the Institute’s research activities are closely aligned to the day-to-day needs of the sector.

With the aid of various official bodies, the BBRI encourages companies to continue innovating, offering advice that is tailored to the current social challenges and applicable to various domains.

Development, standardisation, certification and approval
At the request of public or private players, the BBRI also works on various development projects (contract research). Actively collaborating in the activities of the standardisation institutes – on the national (NBN), European (CEN) and international (ISO) levels – as well as in those of bodies such as the Belgian Union for Technical Approval in Construction (UBAtc), the Institute is ideally placed to gain insight into the construction sector, so that we can respond more quickly to the future needs of the various building trades.

Dissemination of knowledge and support to companies
The BBRI makes extensive use of information technology in order to efficiently share the results of its work with all companies of the sector. Our website, adapted to the diverse needs of construction professionals, contains the publications of the Institute as well as more than 1,000 construction standards.

Nevertheless, personalised training and technical assistance remain essential for disseminating information and so, along with some 650 information sessions and thematic lectures offered by BBRI engineers, more than 26,000 pieces of advice are issued by the Technical Advice Division each year.